

# PATENT ABSTRACTS OF JAPAN

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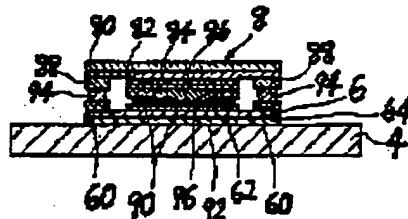
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## (54) SEMICONDUCTOR LASER ELEMENT

### (57) Abstract:

**PURPOSE:** To improve the cooling efficiency of a P-N junction nitrogen-gallium semiconductor chip by a method wherein a pair of electrodes on a semiconductor chip and the opposing electrode on a heat conducting insulating spacer are fixed by a conductive bonding agent with heat conductivity.

**CONSTITUTION:** An N-type GaN layer 82, an N-type InGaN layer 84 and a P-type GaN layer 86 are laminated on a saphire substrate 80 which is a growth substrate. A semiconductor chip 8 is fixed on a supporting plate 4 through the intermediary of a heat conductive insulating spacer 6 which is larger in size than the semiconductor chip 8, and a pair of electrodes 88 and 92 of the semiconductor chip 8 are formed on the P-type GaN layer 86, which is opposing to the supporting substrate 4, and the N-type GaN layer 82. On the other hand, opposing electrodes 60 and 62 are formed on the position of the heat conductive insulating spacer 6 which is corresponded to the electrodes 88 and 92 of the semiconductor chip 8, and the electrodes 88 and 92 of the semiconductor chip 8 and the opposing electrodes 60 and 62 are fixed by conductive bonding agents 94 and 96 having excellent heat conductivity.




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### LEGAL STATUS

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## CLAIMS

[Claim(s)] 6-232510

[Claim 1] A growth substrate, and n form and p form gallium-nitride layer which were formed one by one on this growth substrate, In the semiconductor laser element with which the semiconductor chip with the electrode of the couple formed in these p forms and n form gallium-nitride layer, respectively is prepared on a support substrate at least The above-mentioned semiconductor chip is being fixed on the support substrate through the thermally conductive insulation spacer larger than the size of a semiconductor chip. The electrode of the couple of the above-mentioned semiconductor chip is formed in p form and n form gallium-nitride layer which counter with a support substrate, respectively. It is the semiconductor laser element which a counterelectrode layer is formed on the other hand on the above-mentioned thermally conductive insulation spacer which countered with these electrodes, and is characterized by fixing the above-mentioned electrode and the counterelectrode layer by the electroconductive glue with thermal conductivity.

[Claim 2] The semiconductor laser element according to claim 1 characterized by for the growth substrate of the above-mentioned semiconductor chip consisting of a sapphire substrate, and the above-mentioned thermally conductive insulation spacer consisting of the thermally conductive good quality of the material from the sapphire substrate.

[Claim 3] The electrode formed in the above-mentioned n form gallium-nitride layer is a semiconductor laser element according to claim 1 or 2 characterized by being formed by etching in a part of p form gallium-nitride layer.

[Claim 4] The counterelectrode layer formed in the above-mentioned thermally conductive insulation spacer is a semiconductor laser element according to claim 1 to 3 characterized by having extended outside the polymerization section with a semiconductor chip.